CHAPTER 4
ANALYSIS AND DESIGN

4.1 Analysis

This program will analyze student's grade in Informatics Engineering department at Soegijapranata Catholic University using PAP and PAN assessment method. Those method use statistical formula to get the grade that used as reference of student' s achievement. Below are the formulas that used to completed the PAP and PAN assessmet method.

1. PAP [8]

$$PAP = \frac{Xi}{xmaximal} x\,100$$

explanation :
Xi : student ' s grade
xmaximal : maximal grade

Illustration 3: Mean Formula

the student's grade will divided with maximal grade that specified before, those result will multiplied with 100.

2. Mean[9]

$$\bar{x} = \frac{\sum Xi}{n}$$

explanation :
$\bar{x}$ *: mean*
$\sum Xi$ *: total of frequencies*
n : frequencies

Illustration 4: Mean Formula

Mean is the statistic formula to calculate the average of student's grade. The value of 76 is the result from the sum all of the student's grade. And the value

8 Pohan Rahmadanni, "Interpretasi Nilai Evaluasi Menilai (PAN & PAP)", 2012
9 Bambang Kustituanto and Rudy Badrudin, "Statistika 1 (Deskriptif)", Gunadarma, Jakarta, 1994

of 10 is the total of student's grade, then the sum all of student's grade will divided by the total of student's grade to get the mean result. And the result is 7,6.

3. Standard Deviation [10]

$$S = \sqrt{\frac{\sum (Xi - \bar{x})^2}{(n-1)}}$$

explanation :
S : *standard deviation*
Xi : *data*
$\bar{x}$: *mean*
n : *fequencies*

Illustration 5: Standard Deviation Formula

The standard deviation formula is formula to calculate the diversity of student's grade. The value of 16,4 is the result from the every single data reduced by mean and the result will be squared and summed. And the value of 9 is the total of student's grade reduced by 1, then the 16,4 will divided by 9 and those result are square root to get the standard deviation result. And the result is 1,35. The standard deviation and mean formula is used to calculate the PAN assessment method.

10 Bambang Kustituanto and Rudy Badrudin, "Statistika 1 (Deskriptif)", Gunadarma, Jakarta, 1994

4. Scale 9 PAN[11]

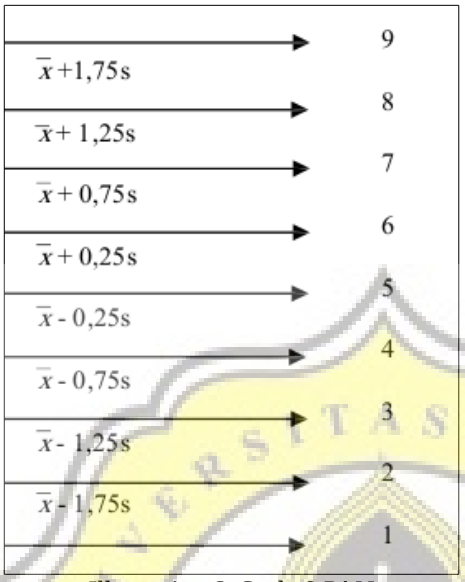

Illustration 6: Scale 9 PAN

Scale formula 9 is used to calculate the final student grade's in PAN.

Example to resolve the count using PAP and PAN assessment method :

Here the data of 10 student's grade

8, 9, 7, 9, 6, 5, 8, 8, 9, 7

1. PAP Method

11 Ula Sidratil, "Penilaian Acuan Norma", 2017

Angka	Huruf
> 80	A
75-79	AB
70-74	B
65-69	BC
60-64	C
55-59	CD
50-54	D
<50	E
0	K

Table 1: Grade That Specified Before

$\frac{8}{10} x 100 = 80$ $\frac{9}{10} x 100 = 90$

$\frac{7}{10} x 100 = 70$ $\frac{9}{10} x 100 = 90$

$\frac{6}{10} x 100 = 60$ $\frac{5}{10} x 100 = 50$

$\frac{8}{10} x 100 = 80$ $\frac{8}{10} x 100 = 80$

$\frac{9}{10} x 100 = 90$ $\frac{7}{10} x 100 = 70$

Illustration 7: PAP Calculation

No	Angka	Huruf
1	80	A
2	90	A
3	70	B
4	90	A
5	60	C
6	50	D
7	80	A
8	80	A
9	90	A
10	70	B

Table 2: PAP Result

The maximal grade that specified is 10. In illustration below will show the grade that specified before.

2. Mean

$$\bar{x} = \frac{76}{10} = 7{,}6$$

Mean is the statistic formula to calculate the average of student's grade. The value of 76 is the result from the sum all of the student's grade. And the value of 10 is the total of student's grade, then the sum all of student's grade will divided by the total of student's grade to get the mean result. And the result is 7,6.

3. Standard Deviation

$$S = \sqrt{\frac{16{,}4}{9}} = 1{,}35$$

The standard deviation formula is formula to calculate the diversity of student's grade. The value of 16,4 is the result from the every single data reduced by mean and the result will be squared and summed. And the value of 9 is the total of student's grade reduced by 1, then the 16,4 will divided by 9 and those result are square root to get the standard deviation result. And the result is 1,35. The standard deviation and mean formula is used to calculate the PAN assessment method.

4. Scale 9 PAN

7.6 + 1.75(1.35) = 9.7

7.6 + 1.25(1.35) = 9.3

7.6 + 0.75(1.35) = 8.6

7.6 + 0.25(1.35) = 7.9

7.6 – 0.25(1.35) = 7.3

7.6 – 0.75(1.35) = 6.5

7.6 – 1.25(1.35) = 5.8

7.6 – 1.75(1.35) = 5.4

Angka	Huruf
>= 9.7	A
9.3 – 9.6	AB
8.6 – 9.2	B
7.9 – 8.5	BC
7.3 – 7.8	C
6.5 – 7.2	CD
5.8 – 6.4	D
5.4 – 5.7	E
< 5.4	K

Table 3: PAN Calculation

Nilai	Huruf
80	BC
90	B
70	CD
90	B
60	D
50	K
80	BC
80	BC
90	B
70	CD

Table 4: PAN Result

4.2 Design

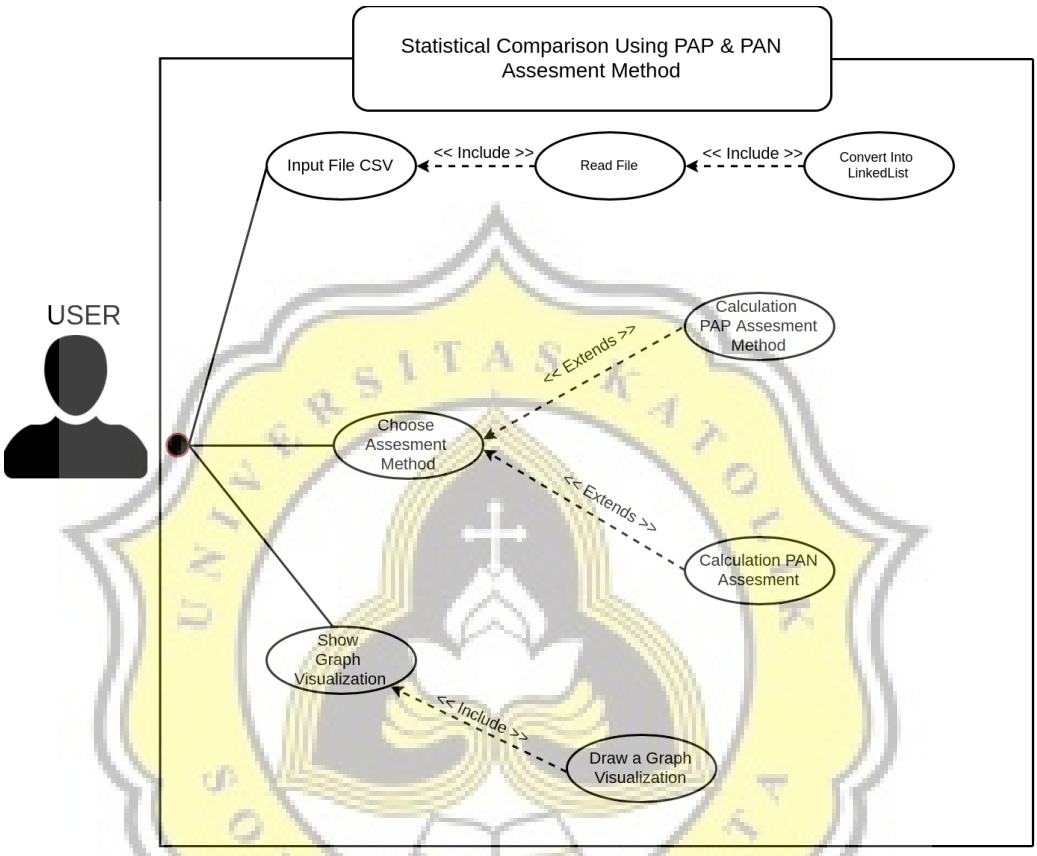

Illustration 8: Use Case Diagram

In use case above show that, the “Input File CSV” is a process to read and convert the data into doubly linked list. The CSV file is stored all the student’s grade of system administration subject. Those data consist number, year, subject code and student's grade. Those file is stored student's grade in various years. In illustration below will show the CSV file.

2003	1	2032575	77
2003	2	2032575	74
2003	3	2032575	78
2003	4	2032575	71
2003	5	2032575	78
2003	6	2032575	73
2003	7	2032575	85
2003	8	2032575	69
2003	9	2032575	78
2003	10	2032575	76
2003	11	2032575	72
2003	12	2032575	72
2003	13	2032575	76
2003	14	2032575	75
2003	15	2032575	72
2003	16	2032575	70
2003	17	2032575	76

Illustration 9: CSV File

All the data will be stored in doubly linked list. In one node of linked list will stored number, year, subject code, and student's grade. In illustration below is node visualization in linked list.

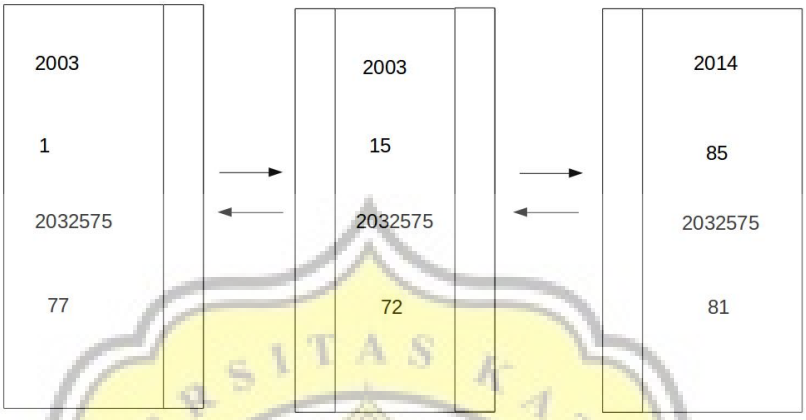

Illustration 10: Node in Doubly Linked List

As shown in the illustration above, the doubly linked list have 2 pointer, there are next and prev pointer. The next pointer is used to connect the next node and the prev pointer is to connect the pevious node.

In use case diagram “Choose Assessment Method” in illustration 12 show that user can choose the assessment method in this program. The assessment method that offered in this program in PAP and PAN assessment method. In illustration below is the step to complete the PAP and PAN assessment method.

1. PAP method

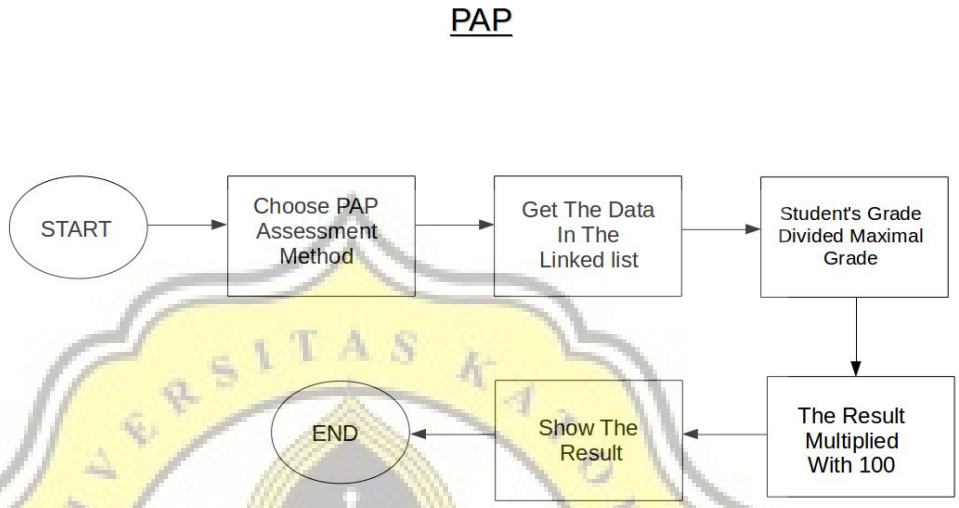

Illustration 11: PAP Flowchart

PAP is a assessment method that offered in this program. In illustration above show the step to completed the PAP assessment method. First, user choose PAP assessment method, then this program will get the data in linked list. After the data is successfully taken then the student's grade will divided with maximal grade that specified before, those result will multiplied with 100. After get the PAP assessment result this program will show it.

- Mean

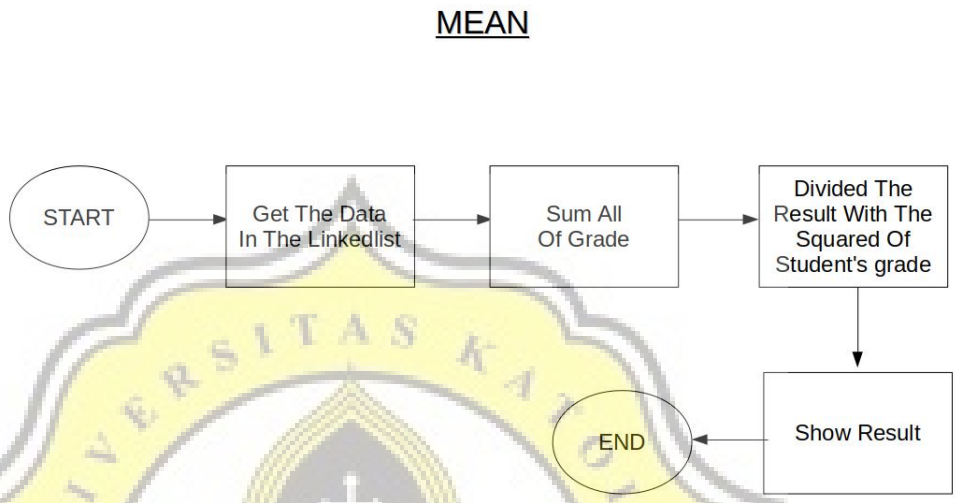

Illustration 12: Mean Flowchart

Mean is the statistic formula to calculate the average of student's grade, first step to calculate the mean formula in this program is the program will get the data in linked list. After that this program will summed all of the student's grade. Those result will divided by the total of student's grade to get the mean value and then this program will show the result.

- Standard Deviation

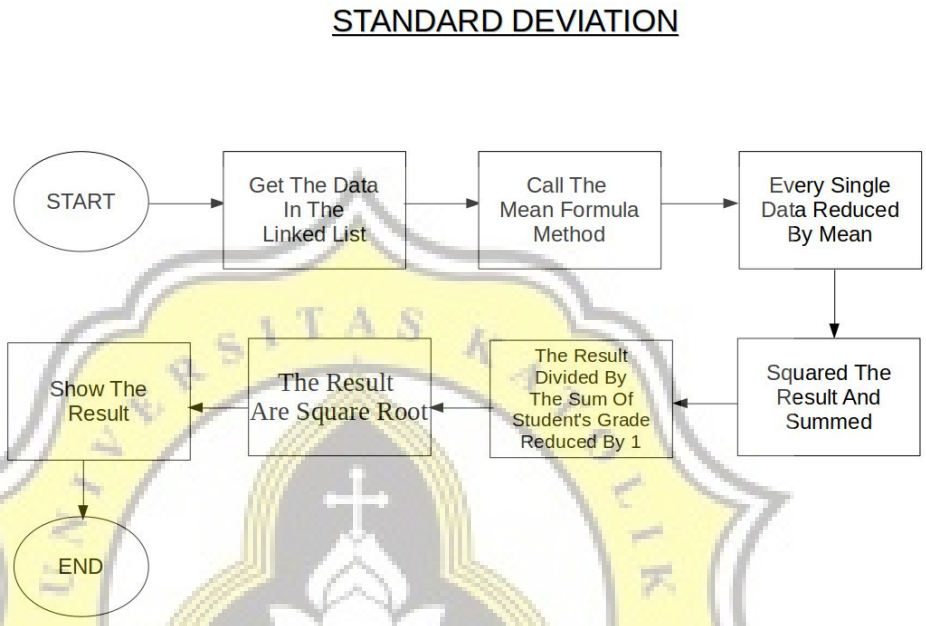

Illustration 13: Standard Deviation Flowchart

The standard deviation formula is formula to calculate the diversity of student's grade. In illustration above is show the step in this program to completed standard deviation calculation. The first step is this program will get the data in linked list and call the mean function. After that every single data reduced by mean and the result will be squared and summed. Then it divided by the sum of student's grade reduced by 1, and those result are square root. And this program will show the result.

- Scale 9 PAN

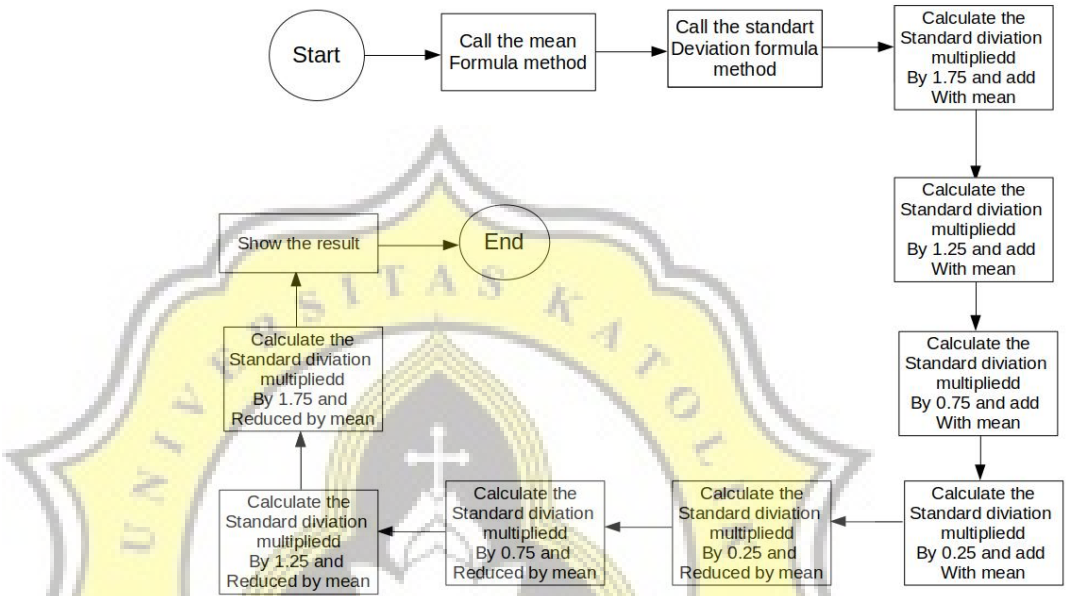

Illustration 14: Scale 9 PAN Flowchart

This program uses scale 9 to completed PAN assessment method. Those scale is used for reference of student's grade. To completed the scale 9 calculation the first step is call the mean and standard deviation function. Then the result of standard deviation will multiplied by 1.75 and add with mean to get the minimum value of A. To get the A value the student must have value more then or equal to minimum value of A.

The result of standard deviation will multiplied by 1.25 and add with mean to get the minimum value of AB. To get the AB value the student must have value more then or equal to minimum value of AB and under the minimum value of A.

The result of standard deviation will multiplied by 0.75 and add with mean to get the minimum value of B. To get the B value the student

must have value more then or equal to minimum value of B and under the minimum value of AB.

The result of standard deviation will multiplied by 0.25 and add with mean to get the minimum value of BC. To get the BC value the student must have value more then or equal to minimum value of BC and under the minimum value of B.

The result of standard deviation will multiplied by 0.25 and reduced by mean to get the minimum value of C. To get the C value the student must have value more then or equal to minimum value of C and under the minimum value of BC.

The result of standard deviation will multiplied by 0.75 and reduced by mean to get the minimum value of CD. To get the CD value the student must have value more then or equal to minimum value of CD and under the minimum value of C.

The result of standard deviation will multiplied by 1.25 and reduced by mean to get the minimum value of D. To get the D value the student must have value more then or equal to minimum value of D and under the minimum value of CD.

The result of standard deviation will multiplied by 1.75 and reduced by mean to get the minimum value of E. To get the E value the student must have value more then or equal to minimum value of E and under the minimum value of CD. And if the student get the value under the minimum value of E then the student will get K value. The illustration below will show the processed in this program to completed the PAN assessment method.

2. PAN

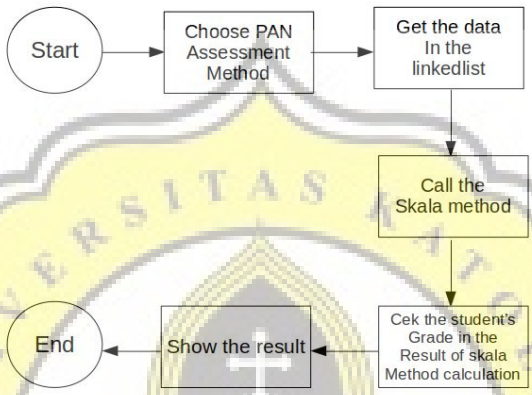

Illustration 15: PAN Flowchart

PAN is a assessment method that offered in this program. The first step to completed this assessment is user choose PAN assessment method, then this program will call scale 9 PAN function. After this program get the specified grade from scale 9 PAN function then this program will check the student's grade using those specified and this program will show the result.

In use case diagram “Show Graph Visualization” in illustration 12 show that user can choose graph menu. If user choose thoose menu then this program will draw a 2D graph using JavaScript that used CGI to connect the C programming language with JavaScript programming language. This graph will show the student's data.